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Use of Protective Behavioral Strategies and their Association to 21st Birthday Alcohol Consumption and Related Negative Consequences: A Between- and Within-person Evaluation

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Abstract

The purpose of the present study was to examine between- and within-person relationships among protective behavioral strategies (PBS), alcohol consumption, and related negative consequences during the 21st birthday week. Participants for the present study included undergraduate college students (N = 1,028) who turned 21 during three academic quarters at a large public northwestern university in the U.S. Students completed a Web-based survey that was comprised of measures of 21st birthday PBS, alcohol consumption, and alcohol-related negative consequences. Between-person findings indicated that participants who employed more manner of drinking PBS and fewer serious harm reduction PBS consumed fewer drinks and reached lower BACs. Results also showed that participants who employed a greater number of limiting/stopping PBS and who used more manner of drinking PBS experienced fewer negative consequences. Within-person findings demonstrated that on days when participants used more limiting/stopping PBS, fewer manner of drinking PBS, and more serious harm reduction PBS than average they also consumed more drinks and reached higher BACs. When examining negative consequences, within-person results showed that on days when participants used more limiting/stopping PBS, fewer manner of drinking PBS, and more serious harm reduction PBS than usual they experienced more negative consequences. Discussion focuses on clarification of the association between PBS and drinking and implications for preventive interventions.

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Keywords

21st birthday drinking; alcohol use; alcohol-related consequences; within-person analysis; event-specific drinking; protective behavioral strategies

Research has shown 21st birthday celebrations to be among the heaviest drinking occasions of college students (Neighbors et al., 2011), with approximately half of 21st birthday drinkers reporting greater consumption on this occasion than any previous occasion (Rutledge, Park, & Sher, 2008). Twenty-first birthday drinking is associated with negative consequences, such as blacking out and not remembering part of the previous evening (Lewis, Lindgren, Fossos, Neighbors, & Oster-Aaland, 2009; Wetherill & Fromme 2009). Moreover, Lewis and colleagues (2009) found that half of those surveyed reported experiencing at least one alcohol-related negative consequence during the week of their 21st birthday. Because the majority of students (80%) report consuming alcohol on this occasion (Neighbors, Spieker, Oster-Aaland, Lewis, & Bergstrom, 2005; Rutledge et al., 2008) and consume more alcohol during 21st birthday celebrations than anticipated (Brister, Wetherill, & Fromme, 2010), it is important to explore risk and protective factors associated with 21st birthday drinking and consequences. Previous cross-sectional research has shown a between-person relationship between drinking protective behavioral strategies (PBS) and drinking behavior (e.g., Benton et al., 2004; Glassman, Werch, & Jobli, 2007; Martens et al., 2005; Sugarman & Carey, 2007); however, within-person effects for PBS on drinking and negative consequences has yet to be examined at the event-level. Thus, the purpose of the present study was to examine the use of PBS in relation to 21st birthday week drinking and related negative consequences at a daily level.

Drinking Protective Behavioral Strategies

PBS are cognitive-behavioral strategies used to reduce or limit alcohol consumption and/or minimize related negative consequences (e.g., Benton et al., 2004; Glassman et al., 2007; Martens et al., 2005; Sugarman & Carey, 2007). Examples of strategies include spacing drinks, alternating alcoholic drinks with non-alcoholic beverages, setting limits on consumption, and using a designated driver. The majority of research evaluating the relationship between PBS and drinking behavior has been cross-sectional. Thus, temporal associations and causal sequences between PBS and drinking have not been firmly established. Cross-sectional findings have suggested both direct and mediating effects such that greater use of PBS were associated with less alcohol use and fewer negative consequences (e.g., Benton et al., 2004; Glassman et al., 2007; Martens et al., 2005, 2008; Sugarman & Carey, 2007). Thus, PBS have typically been described as preceding and resulting in reduction in harmful drinking. However, it is also possible that PBS are planned in anticipation of heavy drinking. For example, selection of a designated driver or committing to having no more than a pre-specified number of drinks may occur primarily on days when individuals have intentions to drink more than what they may consider safe or what they may normally do (e.g., on their 21st birthday). Prospective and within-person studies are needed to more specifically evaluate the occurrence of PBS in relation to drinking and negative consequences. The current study extends this research literature by examining the use of PBS in relation to 21st birthday drinking and related negative consequences at both between- and within-person levels.

21st Birthday Drinking

Of the research that has examined risk factors associated with 21st birthday drinking, findings have shown 21st birthday drinking to be postively associated with typical drinking,

21st birthday drinking intentions, 21st birthday perceived norms, sensation seeking, and impulsivity (Day-Cameron, Muse, Hauenstein, Simmons, & Correia, 2009; Neighbors, Lee, Lewis, Fossos, & Walter, 2009). Little research has evaluated factors associated with reduced drinking during 21st birthday celebrations. Neighbors and colleagues (2009) found that greater use of PBS was negatively associated with the number of drinks consumed and the blood alcohol concentration (BAC) reached on one's 21st brithday. The relationships among PBS during the 21st birthday week and problems experienced during 21st birthday week celebratory drinking have yet to be evaluated. This is important because many of the problems that individuals experience may fall on the day following one's drinking. For example, not remembering part of the previous evening or experiencing a hangover as a result of drinking will likely occur the day following the celebration rather than the day of the celebration.

Prior research has shown 21st birthday drinking to be influenced by drinking shots, drinking at a fast pace, celebrating with influential peers, and engaging in 21st birthday traditions (Brister et al., 2010). Based on these drinking patterns, it seems likely that use of PBS during the 21st birthday week would also be associated with experiencing fewer negative consequences. While between-person findings have shown PBS to be negatively associated with 21st birthday drinking (Neighbors et al., 2009), the present study also extends the literature by examining within-person variation in PBS, drinking, and their associations over the week of the 21st birthday. Utilization of a within-person approach is likely to provide greater precision in our understanding of factors associated with 21st birthday drinking, as this approach avoids averaging across experiences (i.e., between-person), and provides more precise contextual information (Weinhardt & Carey, 2000). Furthermore, an advantage of a multilevel approach is that it allows for simultaneous evaluation of between-person and within-person effects of PBS on drinking and alcohol-related consequences during the birthday week. Thus, we can simultaneously evaluate how drinking differs between individuals who use more versus fewer PBS and, within individuals, how drinking and consequences differ on days associated with engagement of more versus fewer PBS.

The Present Study

The primary aim of the present study was to examine between- and within-person relationships among protective behavioral strategies (PBS), alcohol consumption, and related negative consequences during the 21st birthday week. Based on the above considerations, and consistent with previous research, we expected that, between-persons (i.e., on average across days), people who used more PBS would consume fewer drinks, reach lower BACs, and experience fewer negative consequences. In contrast, for within-person evaluations, we expected days that people used more PBS than usual to co-occur with days of higher drinking and greater consequences. This is consistent with the notion that individuals anticipate drinking more on their 21st birthday celebrations and therefore may offset potential negative alcohol-related effects by using more PBS.

Method

Participants

Participants included undergraduate college students (N = 1,124; 55% women) who turned 21 during three academic quarters at a large public northwestern university. Ethnic composition included 61.8% White, 25.9% Asian, 6.2% multi-racial, and 6.1% other. Additional information about this sample can be found in a comparison of drinking on different holidays relative to the 21st birthday (Neighbors et al., 2011). Because PBS are theoretically used only when an individual is consuming alcohol, participants in the final analyses included only those students who reported consuming at least one drink during the

21st birthday week (n = 1,028; 66% women). For the daily analyses, we included only days on which participants consumed alcohol (n = 2,940).

Procedures

Lists of all undergraduate students who were turning 21 during the 2007–08 academic year were obtained from the campus registrar's office. Students with birthdays between February 2008 to August 2008 (N = 2,113) were invited to participate in a one-time confidential 45-minute survey about their 21st birthday celebration. Students received mailed and e-mailed invitations beginning four days after their 21st birthday. The letter and e-mail included a description of the project as well as a link to the study website. The invitation e-mail was sent with a separate e-mail that included a personal identification number enabling participants to log on to a secure website that included the consent information and the online assessment. After reading a description of the study and indicating consent, participants completed the assessment. The survey was open for ten days, during which non-responding participants received e-mail and telephone reminders to complete the survey. Of the 2,113 invited students, 1,124 students (53.2%) completed the survey. Recruitment rates were comparable to other large-scale studies in this population (e.g., Kypri, Gallagher, & Cashell-Smith, 2004; McCabe, Boyd, Couper, Crawford, & D'Arcy, 2002). Students were compensated $30 for their participation. All procedures were approved by the university's IRB and a Federal Certificate of Confidentiality was obtained for the project.

Measures

Drinking protective behavioral strategies—Participants identified their use of drinking PBS using the Protective Behavioral Strategies Survey (Martens et al., 2005), which consists of 15 items that measure types of strategies used to be safer or more responsible when consuming alcohol (i.e., limiting/stopping drinking [7 items; α = .71–.78 across the seven days of data], manner of drinking [5 items; α = .36–.62], and serious harm reduction [3 items; α = .69–.82]). Measures of internal consistency are limited to only those students who reported consuming at least one drink during the 21st birthday week (n = 1,028), as these were the students included in the final analyses. Prior research has demonstrated this measure to have good construct and predictive validity (Martens et al., 2005). This measure was modified to assess the use of drinking PBS specifically during the week of one's 21st birthday (i.e., three days prior to birthday, birthday, and three days following birthday). Participants indicated whether they engaged in each PBS on each day of the birthday week. Please see Table 1 for subscale items. Items for each subscale were summed to indicate the number of strategies used on each day of the 7-day period.

Alcohol use—Participants were asked to report the number of standard drinks they consumed and the amount of time spent drinking on each day of the birthday week (i.e., three days prior to birthday, birthday, and three days following birthday; Lewis, Lindgren, Fossos, Oster-Aaland, & Neighbors, 2009; Neighbors, Lee, Lewis, Fossos, & Walter, 2009). The questionnaire was thus similar in format to a brief, one-week time-line follow-back (Sobell & Sobell, 2000) and the daily drinking questionnaire (Collins, Parks, & Marlatt, 1985). Participants were asked, "During the week of your 21st birthday, how much alcohol (measured in number of drinks) did you drink on each day of that week?" If participants indicated that they drank on one of the days of the week they were asked, "You said you drank (INSERT NUMBER) drink(s) on (INSERT DAY OF BIRTHDAY WEEK), (INSERT DATE). Over how many hours did you drink?" Scores represent how many total drinks participants consumed on each day during their birthday week. Time spent drinking was utilized in blood alcohol concentration calculations.

Blood alcohol concentration—Participants' blood alcohol concentrations (BACs) were calculated using a modification of the Widmark formula (Brick, 2006; Watson, Watson, & Batt, 1981) for each day of the birthday week. This formula provides a relatively good estimate of BAC (Brick, 2006; Watson, Watson, & Batt, 1981) and takes into account the amount of alcohol consumed and drinking duration, as well as weight, gender, and average metabolism rate. Since metabolism rate varies across individuals, we used an average rate of .017, subtracting .017 for each hour of consumption. Zero was the minimum BAC and .5 was the maximum. BACs above .5 were recoded to .5, which is considered a potentially lethal dose. Less than 1% of BACs were recoded to .5.

Young Adult Alcohol Problems Screening Test—Participants were asked to report alcohol-related negative consequences that occurred using a modified version of the Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut & Sher, 1992; Kahler, Strong, Read, Palfai, & Wood 2004), which has been shown to have good internal consistency and test-retest reliability (Hurlbut & Sher, 1992). Participants were asked to report the number of times 27 specific problems occurred during the birthday week. Consequences marked as having occurred at least once during the week were followed by additional questions asking on which day(s) of the birthday week the consequence occurred. Fifteen consequences were coded as having occurred on the same day as the drinking in the analyses (e.g., drove after drinking, vomited, got into physical fights, became rude, damaged property, arrested, arrested for drunken driving, skipped an evening meal, participated in drinking games, regretted sexual situations, neglected to use birth control or protection against STIs, had sex when didn't want to, had sex with someone you wouldn't ordinarily have sex with, pressured or forced to have sex, pressured or forced someone to have sex). Three consequences that were likely to have occurred the day after drinking (e.g., headache/hangover, late to school/work because of drinking, did not remember part of the previous evening) were coded as a consequence to the previous day. However, it was difficult to determine when nine consequences were likely to have occurred. Thus, in order to be more conservative and to ensure precision, consequences that may or may not have occurred on that day as a result of drinking that day or that may or may not have occurred as a result of drinking that occurred on the previous day were excluded from the analyses (e.g., doctor told you that your drinking was harming your health, trouble at work or school, fired from job or suspended from school, received a lower grade, had shakes after stopping or cutting down on drinking, felt like you needed a drink just after getting up, felt guilty about drinking, went to anyone for help to control drinking, attended an AA meeting). A total of eighteen items (α = .48–.58 across the 7 days) were summed, representing total incidents of alcohol-related negative consequences and risk behaviors during each day of the birthday week (i.e., three days prior to birthday, birthday, and three days following birthday).

Data Analytic Plan

We utilized three models to determine if between-person findings would indicate that those who used more limiting/stopping PBS, manner of drinking PBS, and serious harm reduction PBS would consume fewer drinks, reach lower BACs, and experience fewer negative consequences. For within-person evaluations, we also used these models to examine if people used more limiting/stopping PBS, manner of drinking PBS, and serious harm reduction PBS than usual on days of more drinking, higher BACs, and greater number of consequences. For all models, we included only days on which individuals drank at all (i.e., drinks > 0). The first two multilevel models predicted number of drinks and BAC on drinking days, respectively. Between-person predictors were gender and average limiting/stopping PBS, average manner of drinking PBS, and average serious harm reduction PBS across the week. All between-person variables were grand mean centered. Gender was included in all analyses as a covariate based on its previous association with alcohol

consumption and alcohol-related negative consequences (O'Malley & Johnston, 2002; Read, Wood, Davidoff, McLacken, & Campbell, 2002). However, as gender was not a primary focus of this paper, we did not test interactions with gender. Within-person predictors were fluctuations in limiting/stopping PBS, manner of drinking PBS, and serious harm reduction PBS on a given day and whether it was the participants' 21st birthday. All within-person variables were centered at the person's mean. The third multilevel model predicted number of negative alcohol-related consequences using a Poisson distribution. The predictors were the same as the previous two models, with the addition of person mean drinks across days (between-person) and fluctuations in drinks on a given day (within-person).

Results

Descriptive Information

Tables 1 and 2 show the percentage of participants who reported using each of the PBS and who reported experiencing each of the negative alcohol-related consequences during the week of their 21st birthday. The most common PBS were going home with a friend (78.6%), knowing where your drink had been (69.9%), and using a designated driver (65.8%), which were all serious harm reduction strategies. The most common negative consequence was having a headache (47.8% of respondents) followed by getting sick or vomiting (37.8%). Findings indicated that number of drinks and negative consequences were highest on days more proximal to the birthday (Figure 1). Roughly a quarter (23.2%) of students experienced at least one consequence the day prior to their birthday. Negative consequences peaked on the actual 21st birthday, with nearly half (48.3%) of participants experiencing at least one consequence that day and 22.9% experiencing at least one negative consequence the day after their birthday. Figure 2 shows that all PBS increased on the participants' 21st birthday, compared to other days during their birthday week. Table 3 presents within-person correlations. The three PBS subscales were positively inter-correlated and both limiting/stopping and serious harm reduction PBS were positively correlated with number of drinks, BAC, and negative consequences. Manner of drinking PBS were negatively correlated with number of drinks, BAC, and negative consequences. Table 4 shows the descriptive statistics for the variables included in the multilevel models.

21st Birthday Week Drinking and Negative Consequences

When examining number of drinks and BAC, between-person findings indicated that men reported consuming more drinks than women reported, but did not reach higher BACs. Participants who employed more manner of drinking PBS consumed fewer drinks and reached lower BACs. However, participants who employed more serious harm reduction PBS consumed more drinks and reached higher BACs. Limiting/stopping PBS were not associated with the number of drinks or BAC. Within-person findings indicated that on days when participants reported employing more limiting/stopping PBS and more serious harm reduction PBS than usual they also consumed more drinks and reached higher BACs. Within-person results showed that on days when participants reported employing more manner of drinking PBS than usual they consumed fewer drinks and reached lower BACs. Furthermore, participants consumed more drinks and reached higher BACs on the day of their 21st birthdays, compared to other days during their birthday week.

When examining negative consequences, between-person findings indicated that men experienced fewer negative consequences across the week than women. Participants who employed a greater number of limiting/stopping and manner of drinking PBS reported fewer alcohol-related negative consequences. People who consumed a greater number of average drinks across the week experienced more negative consequences. Within-person findings suggested that on days when participants used more limiting/stopping and serious harm

reduction PBS they experienced more consequences. On days when participants used more manner of drinking PBS than usual they experienced fewer consequences. Finally, within-person findings indicated that on days when participants reported consuming a greater number of drinks and on the day of their 21st birthdays, they also experienced more negative consequences.

Discussion

The purpose of the present study was to examine between- and within-person effects of PBS on alcohol consumption and related negative consequences during the 21st birthday week. Between-person findings indicated that participants who employed more manner of drinking PBS consumed fewer drinks and reached lower BACs. Results also showed that, on average, participants who employed a greater number of limiting/stopping and manner of drinking PBS experienced fewer negative consequences. However, for participants who employed more serious harm reduction PBS as they consumed more drinks and reached higher BACs. These findings suggest that limiting/stopping PBS and manner of drinking PBS may be used to reduce heavy drinking and/or associated consequences whereas students may be utilizing serious harm reduction PBS in preparation of heavy drinking during the birthday week.

The present study was the first study to our knowledge to examine within-person effects for PBS on drinking and negative consequences. Within-person findings demonstrated that on days when participants used more limiting/stopping PBS and more serious harm reduction PBS than average they also consumed more drinks, reached higher BACs, and experienced more negative consequences. Within-person findings also revealed that on days when participants reported employing more manner of drinking PBS than usual, they consumed fewer drinks, reached lower BACs, and experienced fewer consequences. These findings suggest that students use more limiting/stopping PBS and serious harm reduction PBS and fewer manner of drinking PBS than usual on days they also engage in heavier drinking and experience more subsequent consequences.

The present findings provide preliminary support for the assertion that students adjust their use of PBS to accommodate heavier drinking occasions. Further evidence was provided by examining between- and within-person effects of PBS on alcohol-related negative consequences, controlling for average and daily alcohol consumption. For example, between-person findings indicated that limiting/stopping PBS were associated with *fewer* consequences whereas within-person findings indicated that limiting/stopping PBS were associated with *more* consequences. These findings add to a growing research literature considering factors associated with drinking at between- and within-person levels (e.g., Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005). The present results are similar to other classic multilevel modeling examples (e.g., Raudenbush & Bryk, 1992) in showing how relationships between two variables can be dramatically different depending on the level of analysis. Moreover, average associations between PBS and drinking appear to be relatively independent from their associations on specific drinking events. These findings provide a novel extension to our present understanding of the associations between PBS and drinking in suggesting that when individuals know that they are going to be drinking a lot they may plan in advance for it and likewise increase their use of particular types of PBS on those occasions. In particular, when examining the percentage of students who used each strategy during the week, it appears that when students planned to drink heavily they used more serious harm reduction PBS, such as using a designated driver or making sure to go home with a friend. However, findings from the current study suggest that students were less likely to use strategies aimed at limiting the amount of time spent drinking or the number of drinks consumed than to use strategies related to reducing harm. Thus, although a large proportion of students were using

more serious harm reduction PBS, within-person findings suggested that these PBS were positively associated with consumption, BAC, and consequences.

As an alternative to students planning to use more PBS on days when they plan to drink more, it is possible that some PBS are used by students as a result of heavier drinking and associated consequences. For example, a student may not have planned to alternate alcoholic and non-alcoholic drinks or to have a friend let them know when they had enough to drink. However, after feeling sick to their stomach or after being rude to a friend, the student may decide to use additional strategies, such as beginning to alternate alcoholic and non-alcoholic drinks or to ask a friend to let them know when they have had enough to drink.

More generally, these results add to the literature suggesting that 21st birthdays are events that are associated with problematic drinking. People who consumed a greater number of average drinks across the week experienced more negative consequences and participants consumed more drinks and reached a higher BAC on the day of their 21st birthdays, compared to other days during their birthday week.

Clinical Implications

Many college student prevention and intervention efforts include drinking PBS as a skills-training component (Barnett, Murphy, Colby & Monti, 2007; Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Dimeff, Baer, Kivlahan, & Marlatt, 1999; Larimer & Cronce, 2007; Larimer et al., 2007; Walters & Baer, 2006). When examining the percents of students who used each PBS at least one time during the 21st birthday week, findings from the current study demonstrated that strategies used to limit the amount of time spent drinking, limit the number of drinks consumed, or change the manner in which drinks were consumed were less commonly used than strategies related to reducing harm. The most common PBS were all serious harm reduction strategies. Thus, at least in terms of celebrating their birthdays, students appeared to be less willing to reduce or limit their drinking but appeared to be more motivated to use PBS that were likely to reduce the most severe consequences of use (e.g., knowing where their drink has been or using a designated driver). In other words, students were more likely to use serious harm reduction PBS that were not intended to interfere with their getting intoxicated but may protect them from other harms.

The present findings suggest a need for more nuanced approaches to clinical interventions utilizing PBS. When addressing high-risk drinking occasions, like 21st birthday celebrations, clinicians may need to pay closer attention to *which* PBS students are thinking of using, and in what ways, in order to address drinking risks both globally and during those specific drinking occasions. It might also be helpful to explore students' motivations for using PBS. In some cases, students may consider the use of PBS as a justification for extreme drinking (e.g., "I have a designated driver so I can get as drunk as I want and not worry about it"). Findings from the present study also highlight the potential utility of interventions that focus specifically on drinking behaviors on specific high-risk occasions, as more global intervention strategies may not address drinking risks on those specific days. Future interventions could focus on skills training for students to learn multiple strategies for reducing harm from drinking, as well as seeking to increase their motivation to use these strategies as a means to reduce both heavy drinking and negative consequences. In particular, the present study demonstrated that manner of drinking PBS were consistently associated with reduced drinking, lower BACs, and experiencing fewer negative consequences at both between- and within-person levels suggesting that these PBS may be especially useful to focus on with students as these strategies would allow students to drink but in a less harmful way (i.e., avoiding out-drinking others, avoiding drinking games, not drinking shots).

Limitations and Future Directions

A primary limitation of the current study is that the sample was only comprised of college students from one university. Future research is needed to examine these relationships among samples of both college and non-college adults turning 21. Future research is needed to replicate the present within-person findings when examining general drinking not associated with a specific event. It may be that PBS related to reducing or limiting drinking are used more often during a typical drinking period in comparison to a special occasion when reducing drinking may not be a priority. In addition, we would expect to find similar positive event-level associations between PBS and drinking for other occasions such as Spring Break or New Year's Eve, but future research is needed to evaluate the generalizability of this association.

Conclusions

This is the first study of which we are aware to examine the event-level relationships among PBS, 21st birthday drinking, and negative consequences. The present study extends previous research on PBS and 21st birthday drinking literature by demonstrating that the associations among PBS, drinking, and negative consequences differ when considered at between- and within-person levels and across different types of PBS.

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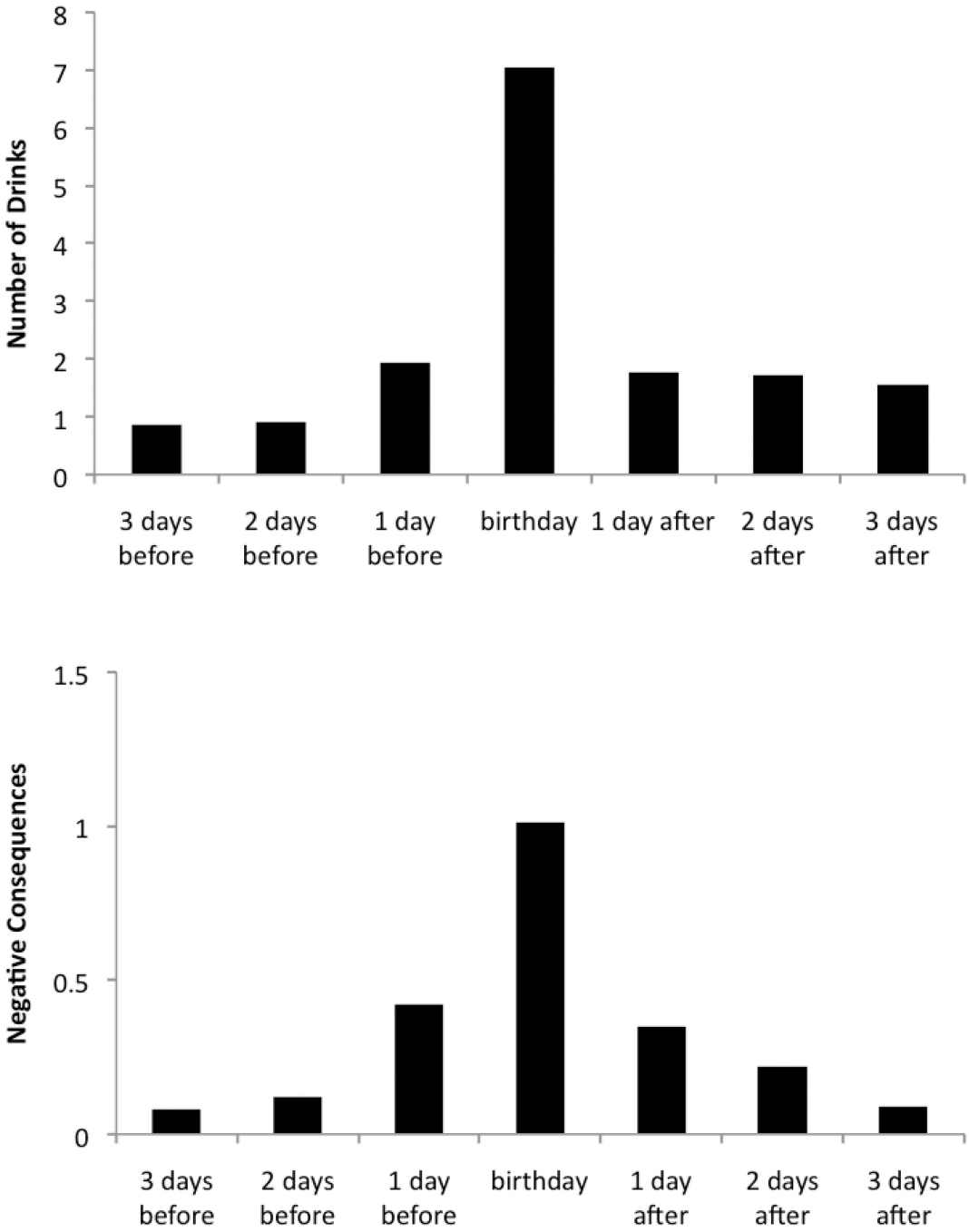

Figure 1.
Mean number of drinks and negative consequences by day of the week.

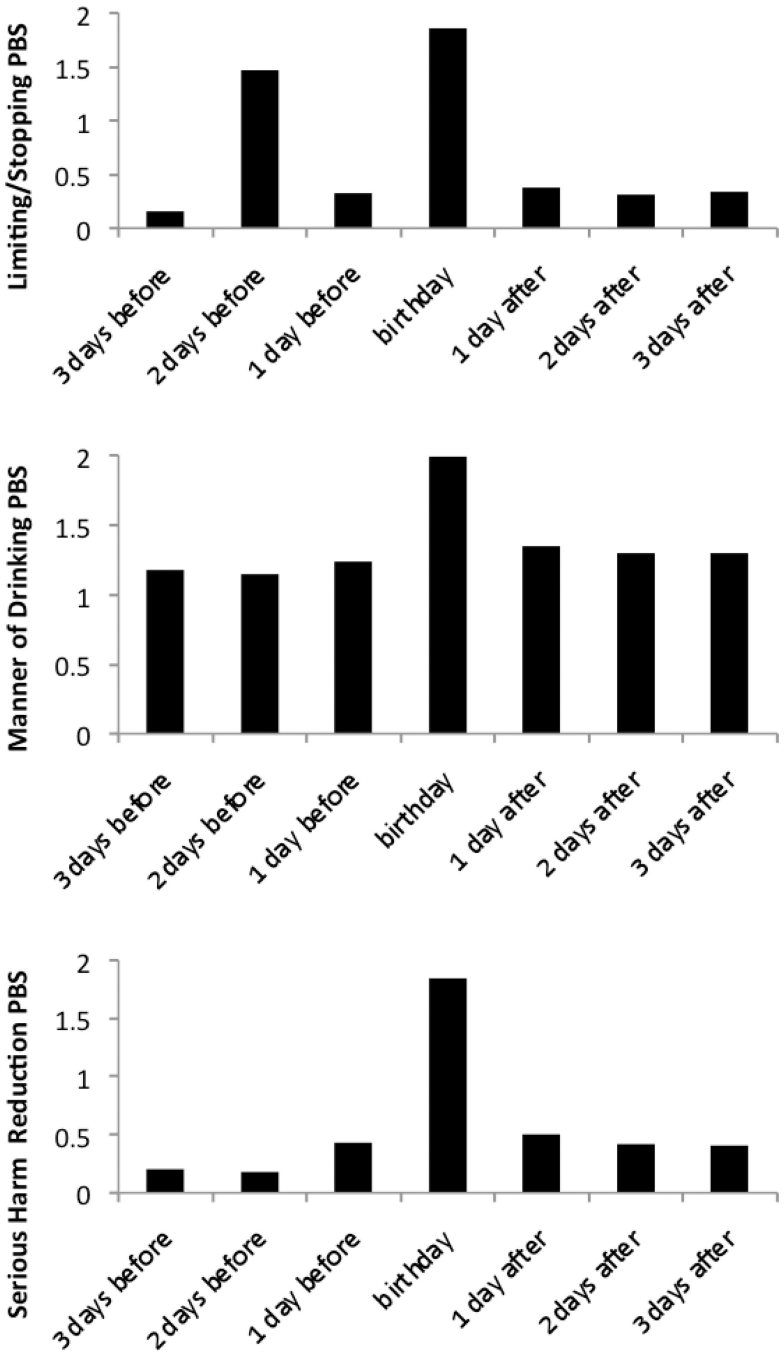

Figure 2.
Mean number of Protective Behavioral Strategies (PBS) by day of the week

Table 1

Percent of Students Who Used Each Protective Behavioral Strategy at Least One Time During the 21st Birthday Week

Limiting/Stopping Protective Behavioral Strategies	
Drank water while drinking alcohol	63.70%
Alternated alcoholic and non-alcoholic drinks	40.60%
Determined not to exceed a set number of drinks	34.10%
Had a friend let you know when you had enough to drink	34.20%
Left the bar/party at a predetermined time	19.90%
Stopped drinking at a predetermined time	17.20%
Put extra ice in your drink	16.20%
Manner of Drinking Protective Behavioral Strategies	
Avoided trying to 'keep up' or 'outdrink' others	59.00%
Drank slowly, rather than gulped or chugged	49.30%
Avoided drinking games	47.00%
Did not drink shots of liquor	99.40%
Avoided mixing different types of alcohol	26.60%
Serious Harm Reduction Protective Behavioral Strategies	
Made sure that you went home with a friend	78.60%
Knew where your drink had been at all times	69.90%
Used a designated driver	65.80%

Table 2

Percent of Students Who Experienced Each Consequence During the 21st Birthday Week

Negative Consequences	21st Birthday Week
Headache (hangover) the morning after drinking	47.80%
Feel very sick to your stomach or throw up after drinking	37.80%
Wake up the morning after a good bit of drinking and find that you could not remember a part of the evening before	30.40%
Drinking contests or drinking games (e.g. ‘quarters’, chugging contests, ‘progressive’ parties)	21.70%
Show up late for work or school because of drinking, a hangover, or an illness caused by drinking	12.30%
Become rude, obnoxious, or insulting after drinking	8.40%
Skip an evening meal because you were drinking	7.90%
Sexual situations which you later regretted	3.30%
Damage property, set off a false alarm, or other things like that after you had been drinking	1.80%
Neglect to use birth control or neglect to protect yourself from sexually transmitted diseases	1.60%
Have sex with someone you wouldn't ordinarily have sex with	1.10%
Have sex when you didn't really want to	1.00%
Physical fights when drinking	0.90%
Drive a car when you knew you had too much to drink	0.80%
Pressure or force someone to have sex with you after you had been drinking?	0.60%
Pressured or forced to have sex with someone because you were too drunk to prevent it	0.40%
Arrested for drunk driving, driving while intoxicated, or driving under the influence?	0.30%
Arrested, even for a few hours, because of other drunken behavior	0.20%

Table 3

Within-person Correlations

Variable	1	2	3	4	5	6
1. Limiting/Stopping	-					
2. Manner of Drinking	.46***	-				
3. Serious Harm Reduction	.56***	.34***	-			
4. Drinks	.08***	−.29***	.25***	-		
5. BAC	.13***	−.27***	.30***	.89***	-	
6. Negative Consequences	.07**	−.25**	.21***	.60***	.59***	-

Note. Ns ranged from 2,940 to 2,981 due to missing data.

*** $p < .001$.

Level 1 correlations and p-values are for descriptive purposes and not intended as inferential statistics, as they do not incorporate nesting.

Table 4

Descriptive Statistics for HLM

	Mean	SD	Range
Level 1 (within-person across days)			
Limiting/Stopping PBS	1.11	1.55	0–7
Manner of Drinking PBS	1.71	1.33	0–5
Serious Harm Reduction PBS	1.26	1.20	0–3
Drinks Per Day	5.50	5.08	1–30
YAAPST[a]	0.68	1.13	0–8
BAC[b]	0.11	0.11	0–0.50[a]
Level 2 (between-persons on average)			
Person Mean Limiting/Stopping PBS	0.51	0.60	0–6
Person Mean Manner of Drinking PBS	1.36	0.62	0–5
Person Mean Serious Harm Reduction PBS	0.57	0.50	0–3
Person Mean Drinks	2.26	2.04	0.14–15.71

Note.

[a]Young Adult Alcohol Problems Screening Test, measuring negative consequences of alcohol use.

[b]Blood alcohol concentration, assessed only on days with alcohol use.

Table 5

Multilevel Model Predicting Drinks and BAC

	Drinks Coefficient [SE]	BAC Coefficient [SE]
Average over Days Intercept, β_0	3.71 [0.13]***	0.096 [.003]***
Male Gender, γ_{01}	2.00 [0.21]***	−0.007 [.004]
Average Limiting/Stopping PBS, γ_{02}	−0.36 [0.22]	−0.008 [.004]
Average Manner of Drinking PBS, γ_{03}	−2.00 [0.19]***	−0.043 [.004]***
Average Serious Harm Reduction PBS, γ_{04}	1.72 [0.23]***	0.033 [.005]***
Average Fluctuations with Limiting/Stopping PBS, β_1 Intercept, γ_{10}	0.64 [0.13]***	0.015 [.003]***
Average Fluctuations with Manner of Drinking PBS, β_2 Intercept, γ_{10}	−1.73 [0.14]***	−0.036 [.003]***
Average Fluctuations with Serious Harm Reduction PBS, β_3 Intercept, γ_{10}	1.86 [0.13]***	0.038[.003]***
Average Fluctuations with Birthday, β_4 Intercept, γ_{30}	2.00 [0.21]***	0.038 [.005]***

Note. N = 1,028 students on N = 2,940 person days.

** p<.01,

*** p<.001.

Gender coded as 0 = women and 1 = men.

Table 6

Multilevel Model Predicting YAAPST Consequences

	Rate Ratio [CI]
Average over Days Intercept, β_0	0.42 [0.37, 0.47] ***
Male Gender, γ_{01}	0.82 [0.70, 0.95] *
Average Limiting/Stopping PBS, γ_{02}	0.84 [.73, .98] *
Average Manner of Drinking PBS, γ_{03}	0.58 [.50, .68] ***
Average Serious Harm Reduction PBS, γ_{04}	1.04 [.90, 1.20]
Person Mean Drinks Across Days, γ_{05}	1.15 [1.10, 1.19] ***
Average Fluctuations with Limiting/Stopping PBS, β_1 Intercept, γ_{10}	1.12 [1.03, 1.22] **
Average Fluctuations with Manner of Drinking PBS, β_2 Intercept, γ_{10}	0.81 [.73, .89] ***
Average Fluctuations with Serious Harm Reduction PBS, β_3 Intercept, γ_{10}	1.34 [1.24, 1.46] ***
Average Fluctuations with Drinks per Day, β_4 Intercept, γ_{20}	1.08 [1.07, 1.10] ***
Average Fluctuations with Birthday, β_5 Intercept, γ_{30}	1.27 [1.11, 1.44] **

Note. N = 1,028 students on N = 2,940 person days.

* $p<.05$,

** $p<.01$,

*** $p<.001$.

Gender coded as 0 = women and 1 = men.